Propositions

accompanying the dissertation

Dynamics of molecular beams in a traveling-wave Stark decelerator

by

Artem Zapara

1. In order to double the effective energy scale probed by a low-energy experiment of the electron EDM, one has to quadruple the total statistics. Presently, achieving the same goal in a high-energy experiment necessitates development of new particle acceleration technologies.

2. Examination of heavy molecules with high-precision spectroscopy connects phenomena at fundamentally different scales: from the size of elementary particles (10^{-15} m) to that of the observable universe (10^{27} m).

3. For a molecule in a Stark decelerator, the internal state dynamics is largely governed by the rotation rate of the electric field.

4. The same Monte-Carlo algorithm used to approximately determine π can also be applied to calculate the phase-space acceptance of a decelerator.

5. Searching for a molecular signal in a noisy background with laser-induced fluorescence is analogous to looking for a black cat in a dark room: it is quite difficult to find, especially when there is no cat.

6. The concept of a nonadiabatic transition encompasses the mutability of processes in physics, biology and even in the social disciplines such as economics.

7. Having a good sense of smell can be vital in saving expensive laboratory equipment from total failure.

8. To satisfy a substantial public demand, every academic researcher should popularize science.